The Cerebellum (2025) 24:131
https://doi.org/10.1007/s12311-025-01883-2

RESEARCH

Functional Assessment of the Subjects with Unertan Syndrome: 10 Years Follow-Up Study

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Accepted: 3 July 2025

Abstract

Unertan Syndrome (UTS) is rare seen a typical autosomal-recessive inheritance disease in the world. This is the first study in the literature that examined physical functioning of subjects suffering from UTS in detail. Five quadrupedal subjects and one bipedal-ataxic subject are presented in this study. Neurological status, activities of daily living, and physical functioning of the cases were assessed. Their parents' level of influence was evaluated using the Impact on Family Scale. We examined all the cases in 2008 for the first time and in 2018 for final assessments. In the second visit in 2018, we found that all the cases had lower physical functioning and showed decreased independence in daily living activities. The quadrupedal subjects were still using quadrupedal gait pattern. We observed that their condition is getting worst as they get older. The parents reported that they influenced by their children's situation. The results obtained from this study showed that UTS affects physical functioning and independence in daily living activities of the subjects. UTS affects parents' lives negatively as well. Both UTS survivors and their parents should be included in an intensive rehabilitation program, including physiotherapy, ergotherapy, speech therapy, social support program, and psychotherapy to prevent health problems and to improve their quality of life.

Highlights

- The re-assessments conducted 10 years later showed that the subjects suffering from UTS are getting worst over years.
- The subjects showed decreased performance in activities of daily living, standing, and walking.
- Rehabilitation program may improve the quality of life of subjects with UTS.
- Although Dr. Tan stated that the subjects with UTS could only use a primitive language, the UTS subjects assessed in this study could use both Turkish and Kurdish languages primitively.

Keywords Unertan syndrome · Quadrupedality · Disability · Physical functioning · Rehabilitation

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Introduction

Developmental neurological diseases are disorders that affect the growth and function of the brain and nervous system. These disorders can lead to problems with movement, learning or behavior [1]. Uner Tan syndrome (UTS) and bipedal ataxia are rare developmental disorders that affect motor coordination and balance. UTS is characterized by a quadrupedal gait, impaired cognition and speech. It is linked to cerebellar underdevelopment and mutations in the VLDLR gene [2, 3]. Bipedal ataxia involves difficulty walking upright due to dysfunction of the cerebellum or sensory system [4]. Together, these conditions illustrate the significant influence of genetics and brain development on human locomotion.

Published online: 12 July 2025

UTS, which was first described in 2005 and 2006, is characterized by three major symptoms: quadrupedal wrist-walking, mental retardation, and primitive language [2, 5, 6]. The analysis of family history revealed out consanguineous marriage, while genetic analysis demonstrated a typical autosomal-recessive inheritance [3, 6–9]. Dr. Tan has discovered a family with UTS that is secondary to consanguineous marriage, and the author has also discovered another 36 years old wrist-walking man in another family, but without a family history of consanguineous marriage [5, 7]. The affected children showed a habitual quadrupedal gait pattern, or, in other words, they walked on wrists and feet with straight legs and arms. Their heads and bodies were mildly flexed; they exhibited mild cerebellar signs and severe mental retardation [5]. The sitting and standing postures of UTS individuals had been analyzed by Dr. Tan [2, 5, 10]. Interestingly, they exhibited flexor posture, similar to our closest relatives, namely bonobos and chimpanzees. The language skills of the affected individuals were primitive [10]. UTS is a new disease in the literature, and motor functions of these patients have never been examined in detail. This study aimed to evaluate and present physical functioning of the subjects with UTS and to investigate the progression in their motor status and physical functioning over time.

Material & Methods

Study Procedure

A family, who has 6 children suffering from UTS, was evaluated first in 2008 by three physical therapists and one translator with good command in Turkish and Kurdish. After the first visit, four physiotherapists evaluated the family again in 2018. Each subject was evaluated twice, first in 2008 and subsequently in 2018. Evaluation data demonstrated by years in the study. The subjects with UTS are presented in this study. In the first visit, five subjects were quadrupedal and one had bipedal-ataxic pattern. Study data was collected through interviews with the father, the mother, and a 26-year old sibling (C.U.) by three physical therapists with twenty-year experience in physical therapy and rehabilitation. Physical therapy assessment was completed in three visits at their home.

The study was conducted in accordance with the Declaration of Helsinki. The father was duly informed about all procedures and written consent was obtained before the assessments. Ethical approval was also obtained from Ethics Committee (Protocol code: 2019/74, Protocol no: 26/06/2019-91).

Communication & Translation Process

During the two visits, communications were translated by a Kurdish-to-Turkish interpreter, whose mother tongue was Kurdish. The translator was living in the same village and was duly informed about the purpose of the study.

The Family

The U. family with nineteen children from the rural southern part of Turkey (Hatay) is the main example of the syndrome in Turkey. The parents of a consanguineous marriage can speak Turkish and Kurdish. The father is more fluent in Turkish than the other. The family had five members with quadrupedal gait pattern and one subject with bipedal-ataxic pattern in 2008. The father is literate in Turkish. He is a retired farmer and has low educational background. The mother is a housewife and not educated (illiterate). They have 19 children and live together in the same house. Their income is very low and they are living under unacceptable circumstances. In the second visit, the same physiotherapists assessed the family members. During the visit, we realized that 2 of the subjects with UTS had died and thus, we evaluated 4 subjects with UTS. In the second visit, parents were living with 4 children with UTS and 1 healthy daughter. Other sisters and brothers were married and left the house. The healthy daughter is also married, but she is at home to help her family.

The Impact on Family Scale

Parents' psychometric status was evaluated with Impact on Family Scale (IFS) [11, 12]. The IFS is a reliable assessment tool to measure the impact on families. The IFS was developed by Stein and Reissman for parents with children suffering from chronic illness. The IFS consists of 33 statements divided to 4 subgroups: (1) Financial Burden; (2) Familial/Social Impact; (3) Personal Strain; (4) Coping/Mastery. The Turkish version of IFS was used in this study. A high score indicates greater impact (min: 24; max: 96) [12].

Neurological Examination of the Cases

Truncal stability during sitting, standing, and walking were observed to assess the spinocerebellar system. Postural fixation, muscle strength, muscle tone, coordination, gait, right/left discrimination, and protective extension mechanism were also evaluated. On the neurological examination, a digital camera and videotape were used to document their movement patterns, gait characteristics, and coordination.

Physical Therapy Assessment of the Cases

On physical therapy examination and inspection, above mentioned three physical therapists looked for normal and abnormal movement patterns, activities of daily living, range of motion, communication skills, mobility, and functions of upper and lower extremities. A Hand Grip Dynamometer (Fig. 1.E) and Universal Goniometer were used to obtain hand grip strength and range of motion (ankle and wrist).

Activities of Daily Living of the Cases

Activities of Daily Living (ADL) and physical environment were evaluated using the Barthel Index [13]. The scores of the index show the independency of the person with disabilities as followed;

*0–20: Fully Dependent; 21–61: Severely Dependent; 62–90: Moderately Dependent;

91–99: Mildly Dependent; 100: Independent.

Locomotion Level of the Cases

Person showing Habitual Quadrupedal Locomotion use their palms to touch the ground during walking. The fingers were extended during quadrupedal walking. During standing, support width was measured and recorded in centimeters. Walking speed (m/s) and cadence (steps/min) were also noted. The standing time (seconds) and the time for standing up from a sitting position (seconds) were recorded [14].

Living Area of the Cases

Home and garden/backyards were inspected. Safety and security of the house were checked and found unacceptable.

Social Participation of the Cases

Social activities and social integration of the cases were also taken into consideration. (Fig. 2.A, 3.C)

Fig. 1 **A**: She can stand with support. Wiping her hands with a towel (Case 1) (in 2008). **B-C**: She showed no any neurodevelopmental progress. She can climb the stairs using her hand. (Case 1) (in 2018). **D**: She has quadrupedal gait (Case 2) (in 2008). **E**: She did complete the handgrip test by a dynamometer (Case 2) (in 2018). **F**: She has quadrupedal gait pattern (Case 2) (in 2018)

Fig. 2 **A**: He has quadrupedal gait pattern and he can walk around in the village (Case 3) (in 2008). **B**: He has quadrupedal gait pattern (Case 3) (in 2018). **C**-**D**: She can sustain one leg standing with minimal assistance, and she can do handicrafts (Case 4) (in 2008). **E**: She has quadrupedal gait (Case 4) (in 2018)

Table 1 Demographics of the cases

Demographics	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Date of birth	1987	1982	1977	1974	1969	1970
Gender	female	female	male	female	female	male
Age (year) (2008/2018)	22/32	27/37	32/42	35/45	40/50	39/49
Height (cm) 2008/2018	148/ 143	154/154	155/155	151/147	151/ -	162/-
Weight (kg) 2008/2018	60/76	76/85	48/56	51/40	37/-	78/-
BMI (kg/m²) 2008/2018	27.39/37.18	32.04/35.30	19.97/23.33	22.36/18.51	16.2/-	48.14/-

Results

Table 1 shows demographics of the 5 quadrupedal subjects (mean age: 31.2 ± 6.9 years) and 1 bipedal-ataxic subject (a 39-year old man).

Cases

Case 1 (E.U.)

2008

A 22-year old female. She is quadrupedal and can walk with minimal physical aid. She is mentally retarded (Fig. 1.A).

2018

She is still quadrupedal and she can climb the stairs (Fig. 1.B-C). When we visited them, she was eating her lunch without aid. We examined her; she understood and obeyed the rules of the tests, such as dynamometer. Next, her brother had a bath and she helped him while dressing. She was shy, but she was communicating with her sisters. Her healthy sister stated that she can sing and dance.

Case 2 (S.U.)

2008

A 27-year old female. She is quadrupedal palmigrade locomotion. She has primitive mental functioning. She can walk with minimal physical aid (Fig. 1.D).

2018

She was glad to see us, and she was sweet. She helped her sisters to have them follow rules of the tests. Her mental status was better than her sisters and brother. She can stand upright with aid (Fig. 1.E-F).

Case 3 (H.U.)

2008

A 32-year old male. He has quadrupedal palmigrade locomotion (Fig. 2.A). He has mental retardation. He can take only 2–3 steps without aid.

2018

His mental illness has progressed. He takes pills prescribed by a psychiatrist, who made diagnosis of schizophrenia in him. He had habitual quadrupedal gait pattern, could walk around the village without any aid and he was not wearing shoes. He was very silent. He walks around in the village every day, comes home and takes bath. When we visited them, he could take a bath without aid. His clothes were dirty and he took a bath only with water, but no soap or shampoo. He wore the same dirty clothes after the bath. All children with UTS were not aware of personal hygiene, except case 3 (Fig. 2.B).

Case 4 (H.U.)

2008

A 35-year old female. She has quadrupedal palmigrade locomotion and mental functioning was primitive. She can take 15–20 steps independently. She can sustain one leg standing with minimal assistance and she can do handicrafts (Fig. 2.C-D). She has dysartric speech and she could speak less a few words.

2018

She cannot walk with habitual quadrupedal gait pattern any more. She needs to crawl in order to ambulate (Fig. 2.E). Her health status seems bad. Her healthy sister reported that she was cleaning the dishes in the past, but she is, now, bad and cannot even go to the bathroom. They have to use diaper for her. (She died in 2019)

Case 5 (S.U.)

2008

A 40-year old female. She had quadrupedal palmigrade locomotion and severe mental retardation. She could not walk independently (Fig. 3.A-B).

2018: She died 1 year ago when she was 48 years old; the family reported that she lost weight and could not walk any more before her death.

Case 6 (G.U.)

2008

A 39-year old male. He had a diagnosis of Disequilibrium Syndrome (bipedal-ataxic). He could walk and climb stairs independently (Fig. 3.C). He was a smoker. He had dysartric speech and he could also speak a few words. He could also take a walk around his village and visited his relatives. He could walk more than 5 miles.

2018

He died in 2017 when he was 48 years old; the family reported that he lost weight and could not walk any more before death.

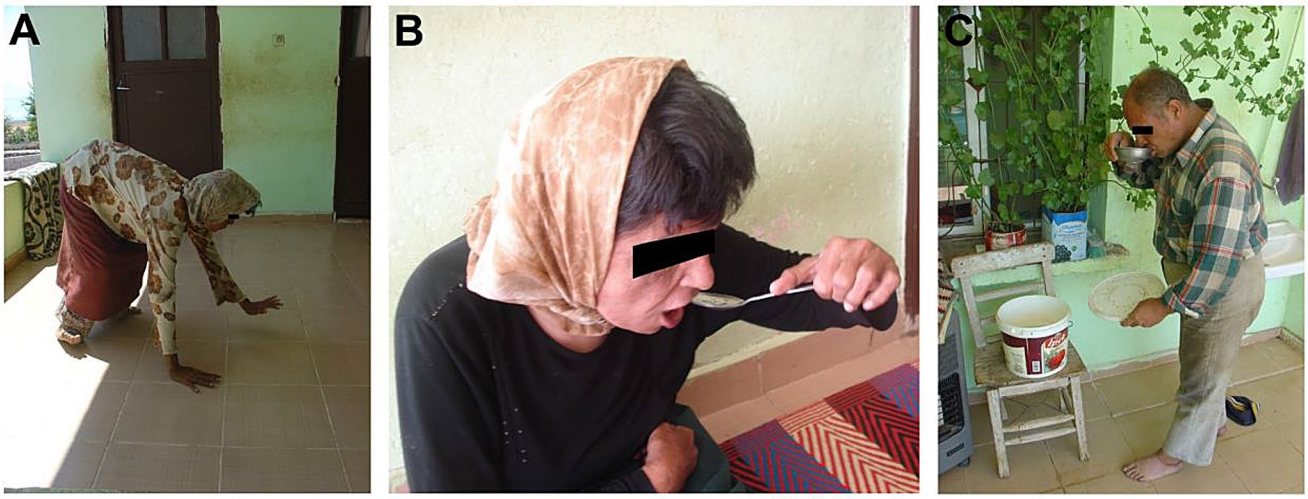

Fig. 3 **A**: She uses her fist while walking (Case 5) (in 2008). **B**: She can use a spoon, and eating activit (Case 5) (in 2008). **C**: He can walk and climb stairs independently (Case 6) (in 2008)

Table 2 The impact on family scale scores of the parents

IFS* Parameters	Father		Mother	
	2008	2018	2008	2018
Financial Burden	12	15	12	14
Social Support	31	35	30	25
Personal Strain	20	24	24	24
Coping/Mastery	7	12	7	9
Total Impact	69	86	69	72

*IFS: Family Impact Scale

The Impact on Family Scale

In 2008, total score in impact on family scale was 69 for the mother and 69 for the father. In 2018, we realized that mother and father got old, had health problems and could not take care of their children anymore. They showed worst scores according to the FIS (Table 2).

Speech

2008: Their speech was very slow and not easily understandable due to articulation difficulties. Their vocabulary was very limited, and they could make very short sentences that consisted of only a few words to communicate with relatives. They could not name many objects.

2018 They can speak Kurdish and understand each other. The family understands what they want, but foreign subjects do not. Case 1 can sing three songs and her vocabulary was limited, as they did not join the social life. They watch Turkish TV, understand the films, and discuss them. Case 5 can understand what we talk about and has dysarthric speech. She also has a limited vocabulary, but her healthy sister declared that her vocabulary has improved. There is no interval change in vocabulary in case 4 relative to the evaluation made one decade ago. Case 3 speaks fewer words, and his vocabulary is apparently poor.

Range of Motion

In 2008, the range of motion was above normal values. We also found that range of motion decreased in 2018. But, the low range of motion was still higher than the ranges recommended by American Society of Orthopedics. We observed that their feet were in external rotation and pronation in standing position (Table 3).

Table 3 Range of motion measurements

Joint			Case 1 EU	Case 2 SU	Case 3 HU	Case 4 HU	Case 5 SU	Case 6 GU
Wrist (deg.)	2008	Right/Left Flex	62/90	90/70	58/68	110/110	92/90	76/80
		Right/Left Ext	104/100	104/100	98/100	106/104	100/96	92/92
	2018	Right/Left Flex	50/55	80/70	60/50	60/60	died	died
		Right/Left Ext	100/100	95/95	90/90	90/90	died	died
Ankle (deg.)	2008	Right/Left DF	14/12	10/5	20/22	20/20	0/22	18/14
		Right/Left PF	90/90	75/40	90/92	72/96	94/99	78/80
	2018	Right/Left DF	5/10	10/0	10/5	20/20	died	died
		Right/Left PF	40/65	60/40	25/5	40/40	died	died

Functions of Upper Extremities

Functions of hand/upper extremities are illustrated in Table 4. The bipedal-ataxic male subject and four quadrupedal subjects are right handed. Only one female subject is left handed.

Functions of Lower Extremities

Functioning of lower extremities and ambulatory activities were evaluated and are presented in Table 5.

Activity of Daily Living - ADL

Table 5 shows the Barthel Index scores of the subjects. All the cases showed decreased independence in terms of ADL performance.

Discussion

We analyzed the patients with UTS that is persisting for 10 years. In the second assessment, their functional status, motor functions, and activities of daily living were worse than the first visit. Two of them died at the age of 48. We recognized that their condition is ever increasingly progressing as they get older. This is the first study in the literature that examined motor functioning of subjects with UTS in detail. There is no previous study that evaluated range of motion, hand-finger strength, dependence level, gait characteristics, coordinated motion of upper extremities, and the family's burden level in these subjects. So, our study will add an important new insight to the literature.

An estimated 10% of the world's population, or approximately 650 million people, suffer from a form of disability [15, 16]. The number of people with disability is growing as a result of certain factors, such as higher average life expectancy based on medical advancements. This syndrome is not common worldwide. To date, it has been seen only in Turkey. UTS subjects with this syndrome has quadrupedal gait pattern, including one subject with primitive speech and severe mental retardation. All of the cases were bilingual in their family lives. All family members could be communicating in Turkish and Kurdish. In this study, the parents were also examined. Chronic illness or disability in families has been shown to affect parents, siblings, and others. Several investigators from Turkey and other countries support the view that mothers and fathers of children with chronic illness/disability are at psychological risk [12, 16–23]. This study evaluated the parents with the impact on family scale to analyze the impact of having disabled children. Total score of impact on family scale is 69 for the mother of children with UTS and 69 for the father in 2008, and the figures increased to 86 for the father, 72 for the mother in 2018. These findings indicate that having disabled children had a negative impact on both the mother and the father. We discovered that when parents were questioned during the second visit, their IFS score increased. The children's health and functional status get worse and they need more care, and moreover, parents get old and have health problems. Although Public Social Service provide the family with economic and social support, parents' score of impact factor increased within this 10-year interval. We questioned the healthy daughter's impact profile, because she started to take care of her family, and we found that she is at psychological risk and she carries an important burden. The present study demonstrated that the parents are at risk in terms

Table 4 Functions of hand/upper extremities

Variable		Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Dominant Hand		right	right	right	right	left	right
Hand Grip Strength	2008	20/19.6	16.3/14.3	11.6/14.3	20.3/19.6	-	29.6/31.3
(Dominant/Non dominant)	2018	30/20	35/35	10/14	5/5	died	died
Finger Grip Strength	2008	3.8/4.5	5.6/6	4.8/7	5/4.6	-	19.3/20.6
	2018	5/9	10/16	not tested/4	5/5	died	died
Right/Left Discrimination	2008	-	+	+	-	-	+
	2018	-			-	died	died
Hand-Eye Coordination	2008	mild	good	poor	good	none	good
	2018	mild	good	poor	good	died	died
Posture Fixation	2008	good	good	good	good	mild	good
	2018	good	good	good	good	died	died
Protective Extension	2008	good	good	good	good	mild	good
	2018	good	good	good	good	died	died
Bilateral Arm Elevation	2008	able	able	able	able	not able	able
(1 min.) (in sitting position)	2018	able	able	able	able	died	died
Bilateral Arm Abduction	2008	able	able	able	able	not able	able
(1 min.) (in sitting position)	2018	able	able	able	able	died	died

Table 5 Gait, balance and activities of daily living assessments of the cases

Variable			Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Gait	Double support distance of legs (cm) (quadripedal)	2008	18 cm	15 cm	24 cm	21 cm	15 cm	15 cm
		2018	40 cm	30 cm	33 cm	not able	died	died
	Double support distance of hands (cm) (quadripedal)	2008	20	20	28	not able	22	20
		2018	35	40	45	not able	died	died
	Walking (bipedal)	2008	15–20 steps	15–20 steps	10–15 steps	15–20 steps	not able	3–5 miles
		2018	not able	not able	not able	not able	died	died
	Steps/ min (quadripedal)	2008	53	53	60	73	64	79
		2018	40	30	22	crawling	died	died
Balance	Standing	2008	able	able	able	able	not able	able
		2018	could do with aid	could do with aid	could do with aid	not able	died	died
	One leg standing	2008	not able	not able	not able	not able	not able	able (3 s)
		2018	not able	not able	not able	not able	died	died
	Raising from ground	2008	not able	not able	able	able	could do with aid	able
		2018	could do with aid	could do with aid	could do with aid	not able	died	died
Activities of Daily Living, Barthel Index		**2008**			**2018**			
	Cases	**Score**	**Dependence Level***		**Score**	**Dependence Level***		
	Case 1	60	severe		50	severely dependent		
	Case 2	65	moderate		60	severely dependent		
	Case 3	65	moderate		60	severely dependent		
	Case 4	80	moderate		20	fully dependent		
	Case 5	35	severe		died	died		
	Case 6	90	moderate		died	died		

*0–20: Fully Dependent; 21–61: Severely Dependent; 62–90: Moderately Dependent; 91–99: Mildly Dependent; 100: Independent

of socio-psychological determinants. Therefore, the parents should also be started most appropriate rehabilitation program to prevent the parents' socio-psychological problems and to increase their quality of life.

Case 5 and 6 both died at the age of 48 years. Other cases could not survive enough to allow progression of the condition so fast. We think their UTS caused fast deficits in balance, ambulation and strength. Case 4 was taking 15–20 steps in 2008, but she lost knee extensor functions, walking and, standing capabilities within 10 years; her health status was getting worse, and she needed to crawl to ambulate. We think that subjects with UTS lose most of their functional capabilities, as they can live up to 50 years.nd 6 both

Functioning of upper extremities was better than that of lower extremities. Five of the patients could raise bilateral arms for 1 min at sitting position and abduct bilateral arms for 1 min at sitting position.

Extensor range of wrist and range of plantar flexion are abnormally above the normal ranges. It is found that dorsiflexion range of the ankle decreased in this 10-year period. This gait pattern affected the ankles. They started to use compensation during dorsal flexion and pronation.

Low handgrip strength tends to be associated with functional limitations and it is a powerful predictor of future disability, physical health problems, and cognitive decline. The mean peak value is about 54 kg for men (ages 30–49), and about 34.5 kg for women (ages 35–44) [24, 25]. Subjects with UTS have very low hand and finger grip strength, because their hands are not functional. Three of them had good hand-eye coordination and all of them had good protective extension and postural fixation. None of them had right/left discrimination in the second visit due to their cognitive status in our opinion.

Subjects with UTS (except case 6) have quadrupedal gait pattern, but they could take 15–20 steps in bipedal gait pattern when assessed in 2008. However, they lost bipedal walking capability in 2018. Standing up from sitting position requires antigravity activity of extensor muscles. This seems very hard for such patients. All of them needed aid for standing up in the second visit. We found that their double support distance increased just because their balance decreased in 10-year interval according to our opinion.

In 2008, one male and four females (Case 1,2,3,4,5) demonstrated quadrupedal gait pattern, and male subject (case

6) had bipedal-ataxic gait pattern. Barthel Index was used to assess activities of daily living. Three cases had a score of 60 to 65 points in the index. One female (Case 5) had a score of 35 points. One male subject (Case 6) and one female subject (Case 4) had scores of 90 and 80, respectively. The results suggest that they are mostly dependent when they perform activities of daily living (see Table 5). In the second visit, we realized that their dependence status worsened.

Apparently, contrary to normal subjects with a dominant extensor motor system during sitting, standing, and walking, the flexor motor system dominates the extensor motor system in the patients with UTS – a finding specifically interesting for the evolutionary process with regard to motor and cognitive functions in human beings.

Here, Uner Tan's claim of "devolution" is refuted. First, all persons with UTS exhibit diagonal-sequence gait during quadrupedal locomotion [26, 27]. Second, Dr. Tan, reported in his first paper that these children making primitive sounds. However, we observed that UTS cases were watching Turkish TV shows and talking Kurdish with other family members. This fact creates another ground to refuse the "devolution" claim. Third, Shapiro et al. examined individuals with UTS using standard gait analysis of 518 quadrupedal strides from video sequences of individuals with UTS, and they found that these patients almost exclusively used lateral sequence quadrupedal gaits rather than diagonal sequence. In fact, the quadrupedalism exhibited by individuals with UTS resembles that of healthy adult humans asked to walk in quadrupedal pattern in an experimental setting and they concluded that quadrupedalism in healthy adults or those with a physical disability can be explained using biomechanical principles rather than evolutionary assumptions [26].

We observed that case 6 could stand upright and walk a few miles and other subjects could also take a few steps in 2008. These results refute the devolution theory of Uner Tan. We think their body adapted to the dysfunction and they had to walk on 4 extremities for ambulation. Moreover, ape's arms are not shorter than their legs, but arms of these subjects are shorter than their legs, as is the case for normal human, and so, their feet and eyes are adapted to quadrupedal gait pattern.

The subjects with UTS have quadrupedal walking pattern with head and neck positioned on the horizontal plane. They cannot position their head and neck on vertical plane even in sitting position.

Most of UTS families live in small villages and their social engagement is very poor. We think that if subjects with UTS have access to special education, they might learn simple activities and take responsibilities.

There are a few studies that examined UTS, but there is no study that addresses physical therapy assessment of these patients. This is the first study that examined physical parameters of UTS subjects.

At this 10-year interval, the condition worsened in all subjects. Their functional capabilities decreased at age of 40. We observed that the subjects UTS die around the age of 50.

Rehabilitation plays an important role in supportive and preventive care system. Physiotherapy may enhance the quality of life of subjects with UTS. Physiotherapy aims to optimize disabled subject's level of physical functioning and take into consideration the interplay between the physical, psychological, and social domains of functions. In this article, the authors present six cases (five cases with UTS and one case with bipedal-ataxia due to cerebellar hypoplasia) and their status was described by physiotherapists. In addition, this study describes what the subjects with UTS needs. The authors addressed that physiotherapy is of great importance in the therapeutic process. It minimizes complications and adverse effects of the syndrome and optimizes status of subjects.

In a brief comment on this study, the authors state that developmental disorders are expected to show gradual improvement in clinical function over time, as opposed to degenerative disorders. However, in these cases, no improvement was observed over time. We believe that the reason for this is that they were never involved in a regular and suitable rehabilitation programme.

Acknowledgements The authors would like to thank Prof. Dr. M. Serefettin Canda, who was Rector of Mustafa Kemal University at that time, for his kindly support this research.

Author Contributions H.H.U: Conceptualization; investigation; methodology; writing – review, editing and research administration. H.H: Conceptualization; data curation; formal analysis; investigation; visualization. U.C: Investigation; methodology; formal analysis; review, editing and research administration. E.D.H: Formal analysis; investigation; visualization.

Funding The authors report no funding.

Data Availability The data used to support the findings of this study are available from the corresponding author upon request.

Declarations

Ethical Approval This study is not approved required for the ethics committee.

Competing Interests The authors declare no competing interests.

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